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The Demographic Effects  
of  
Mortality Reductions  
on  
The Aged Population of the United States:  
Some Baseline Projections

by

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December, 1972

Support for this research has been provided by the National Institute of Child Health and Human Development, Contract Number 72-2767 and the Center for the Study of Aging and Human Development, Duke University.

Basic to the process of planning for the social, economic and health welfare of the older population is an adequate understanding of its future size and composition. While the relatively crude projections of older population that demographers typically make may have served planners and policy-makers reasonably well in the past, there are cogent reasons for turning our attention to more sophisticated and at the same time more relevant efforts at forecasting this population. These include -

- The increasing importance of mortality as a factor influencing population change under conditions of lowered fertility and movement toward stabilization of our population.
- A growing need for appraising the impact of potential medical control programs in affecting morbidity and mortality levels for specific diseases and causes of death.
- A pressing need for information about specific categories of the older population (e.g. sex, age, widowhood, institutionalization status, disability status, etc.)

Demographers must share a considerable part of the blame for failing to provide more reliable and robust population projections. Although the development of new population modeling procedures offers promising possibilities for modifying the current practices, attention has been focused almost exclusively on the fertility component. Fertility alterations, to be sure, do immediately alter the proportions of elderly, but their effect on the absolute number of aged will not be felt for some 65 years. Yet changes in mortality can have an immediate impact, and it is in estimating and assessing future levels of mortality that the demographer has been negligent.

For these reasons and others not directly related to the aged, the Center for Demographic Studies at Duke University, with support from the Adult Development and Aging Branch of NICHD and Duke's Center for the Study of Aging and Human Development, has undertaken a survey of existing population models with an eye toward suggesting more rigorous and realistic methods of forecasting mortality trends. Tonight we present some of the preliminary results of one part of this investigation.

Although methods of constructing life tables that summarize the effects on survivorship of eliminating specific causes of death have been available for some time, to our knowledge few serious attempts have been made to use these methods for projecting actual populations. In this phase of our project, we have prepared such projections using the Chiang "competing risks model" and the Greville "single-cause elimination" method of computing cause elimination life tables. It should be candidly stated that both methods rest upon somewhat less than realistic assumptions, the most critical of which we will discuss momentarily. Nevertheless, these approaches do provide a broad basis for considering the implications of such efforts and they are in many ways quite representative of the state of the art of projection. In this short presentation we have limited ourselves to a discussion of results from only the Greville procedures.

Survivorship rates derived by the Greville procedure have been introduced into a standard cohort-component projection procedure for preparing projections of the United States population by age, color, and sex through the year 2000. This projective procedure simply ages a population forward on the basis of separate projections of age-specific mortality, fertility,

and migration. We employed the C and D fertility projections of the Bureau of the Census, somewhat modified to take into account recent declines, together with the usual Census Bureau migration estimate. In all other aspects, our computations adhere strictly to the actuarial standards set by the National Center for Health Statistics.

In all, four causes of death have been treated - major cardiovascular-renal diseases, influenza and pneumonia, malignant neoplasms, and motor vehicle accidents. Three other causes categories have been deleted from this presentation because they overlap the causes retained or because their elimination produced only very slight changes in the future population.

Finally, although we prepared a set of projections which assumed a linear reduction of the cause-specific rates beginning in 1973 and ending with complete elimination in 1999, the results here refer only to complete immediate elimination in 1973 of all deaths from a selected cause and maintenance of this condition through the year 2000. Quite obviously, neither assumption is realistic. We used them, however, not to prepare accurate predictions, but rather as the basis of a simulation exercise for assessing the implications of two models of predicting mortality and to learn more about the limits that certain aspects of population change - notably size and composition - would approach if certain causes of death were eliminated. It is in this sense that these projections are "baseline" predictions.

Two final cautionary notes:

First, the Greville and Chiang models both assume functional independence between causes of death. This would rule out, for example, the much noted tendency for a reduction in deaths from diabetes to be accompanied



by a reduction in deaths from heart diseases, and hence our projections would not reflect such a relationship.

Secondly, it might be objected that we have intentionally exaggerated the effects of cause-specific mortality reductions by considering only unnecessarily broad etiological categories. Use of more specific categories, however, may introduce rather substantial errors based upon increased mis-specification of cause of death by the certifying nosologist. Moreover, the causes selected have intrinsic interest because they currently are the four major death factors, as well as being the causes with substantial variance with regard to age, sex, and color differentials.

So now we will stop hedging our bets and get down to the concrete numerical results of our exercise.

Figure 1 shows the absolute size of the projected population in the year 2000. Note that while the projection reflecting the elimination of all deaths from major cardiovascular-renal diseases is nearly 75 per cent higher than what would have resulted if there had been no reduction, the corresponding difference for the projection eliminating malignant neoplasms is only 14 per cent. The differences when motor vehicle accidents and influenza and pneumonia are eliminated are even smaller being .8% and 1.9% respectively. This wide disparity between the resulting population from reductions of cardiovascular-renal deaths and from malignant neoplasms is somewhat surprising in light of the relatively high priority assigned in recent years to cancer research.

Figure 2 shows how the proportion of total population age 65 and over could be expected to change over the next thirty years. It is important to remember that the level of fertility strongly influences the proportion

of older persons even though it has no immediate influence on the absolute number of elderly. Indeed, the shape of all four curves reflects the fact that series D fertility assumes a gradual decline to a low occurring in 1993 (for white females) followed by a gradual rise through the year 2000. What is important for our purposes, however, is not the absolute level and shape of the curves, but rather the differences in their levels. Again the impact of cardiovascular-renal reductions greatly exceeds the effects of eliminating other types of deaths; indeed the relatively delayed peaking of the curve would suggest that this effect is so strong that it outweighs that of the upturn in the underlying fertility level, which would be a very unusual event from the standpoint of demographic trends historically.

Figure 3 is interesting in that it demonstrates that of the causes examined only reductions in cardiovascular-renal diseases would so strongly narrow the male-female mortality differentials as to actually reverse the anticipated worsening of the sex balance, (with implications for the extent of widowhood among the aged); although the relatively more gradual slope of all four cause-elimination curves reflects some narrowing of sex differentials in mortality favoring females. Note, too, that although the elimination of motor vehicle accidents has had little perceptible impact upon the demographic dimensions of change discussed heretofore, it does exert a noticeable effect upon the sex ratio.

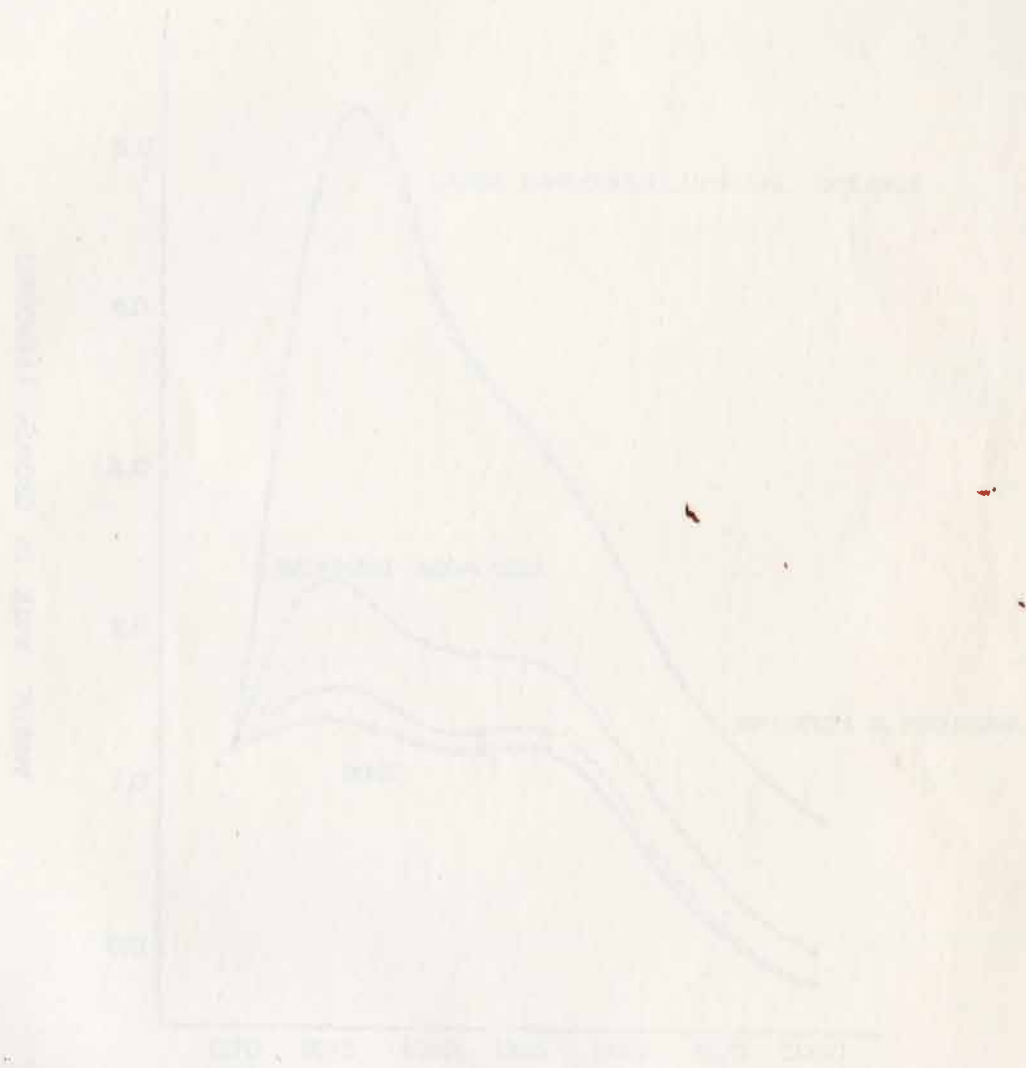
Finally, Figure 4 breaks down the aged population projected for the year 2000 by age groups. Aside from the demonstrated differences between the levels of the absolute population in each age category, what is significant is the relatively large extent to which reductions in major cardio-

vascular-renal diseases would bring about an increase in the number at extreme ages.

These projections repeatedly underscore the importance of major cardiovascular-renal diseases in determining the size and composition of the aged population in the United States. In conclusion, then, we would have to say that the most noteworthy finding of our study, given the limitations of the underlying methodology, is the unexpected magnitude of the effects that mortality from cardiovascular-renal causes have upon the elderly population relative to changes that would be experienced following the elimination of the other causes of death.

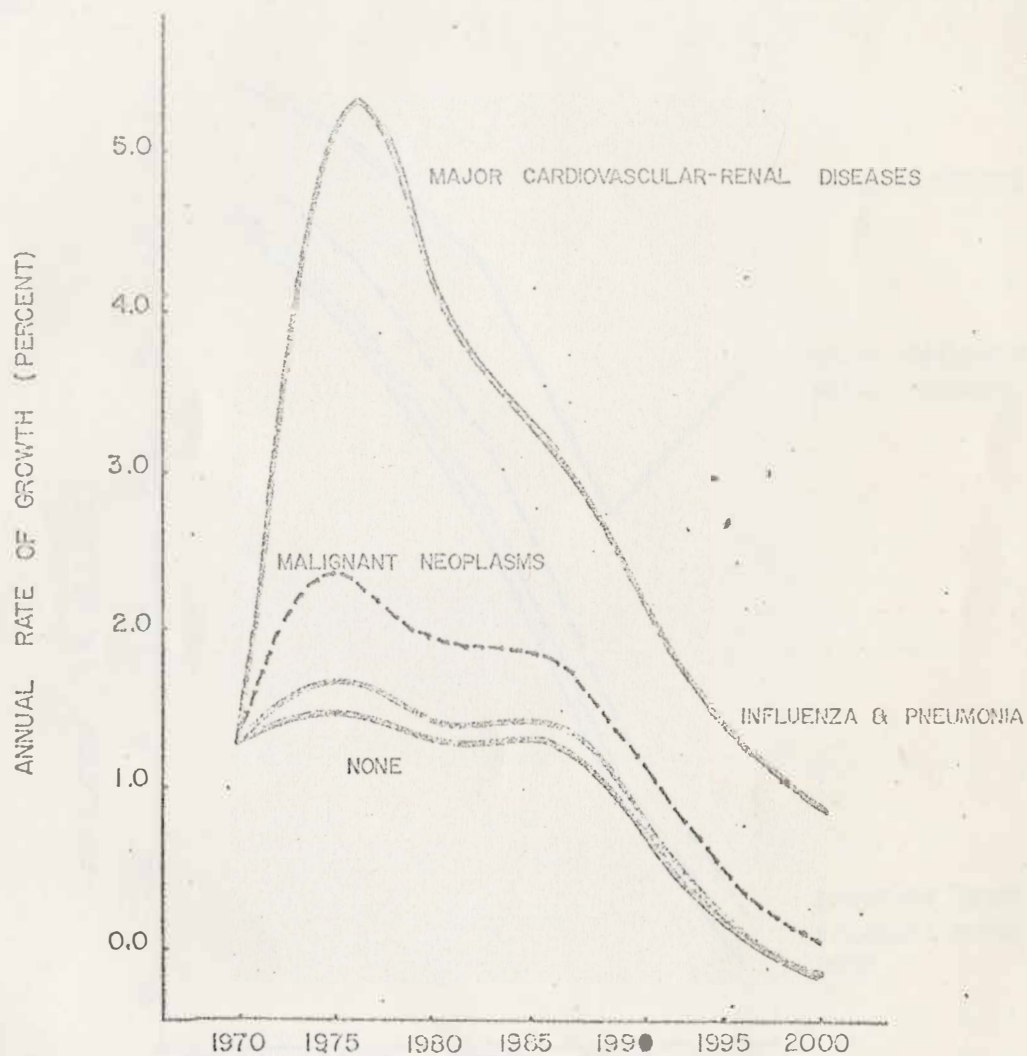
### Acknowledgment

The authors wish to recognize the technical assistance rendered by Robert Hartford, Michael Batutis and Edward Duffy in preparing the projections underlying this report.

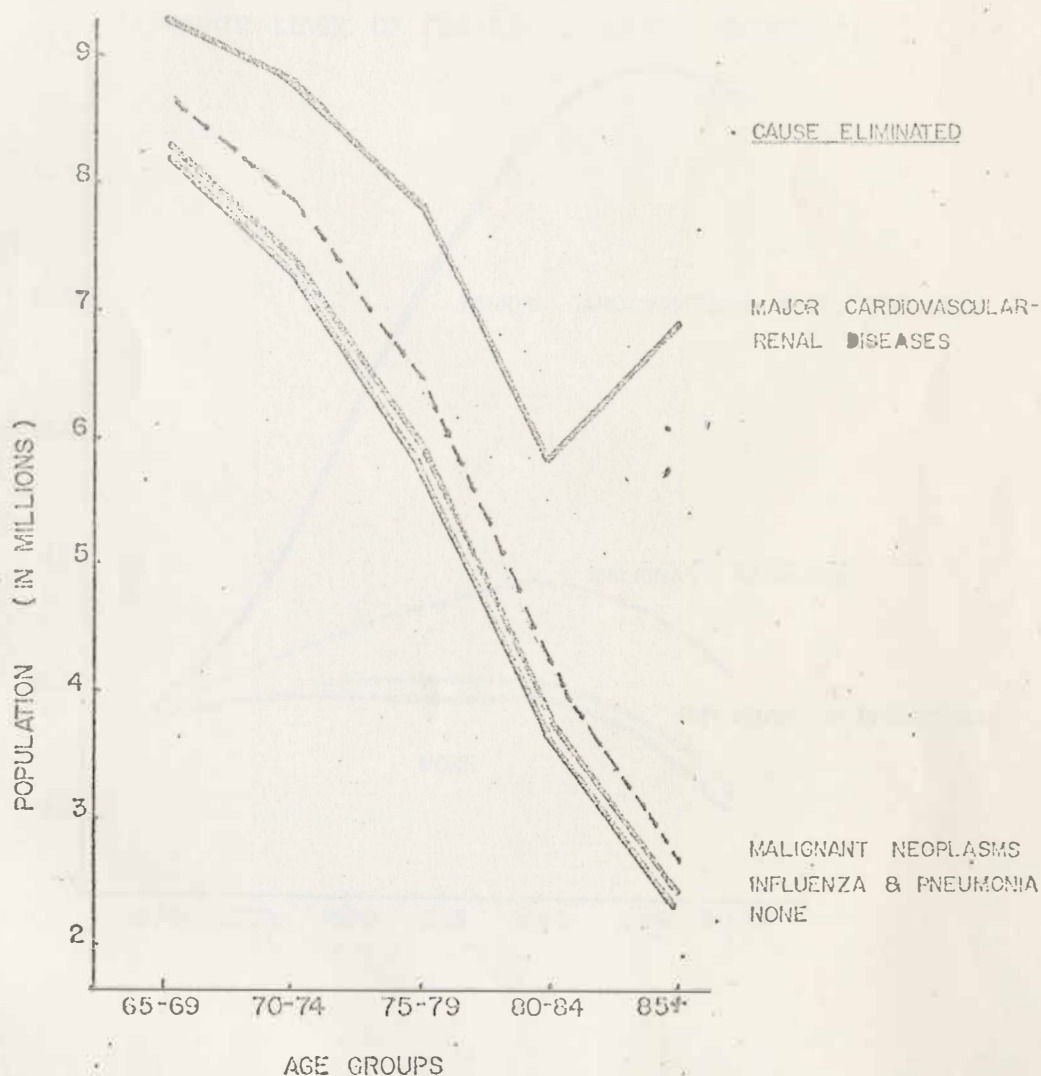




THE ANNUAL RATE OF GROWTH OF THE AGED POPULATION OF  
THE UNITED STATES FOLLOWING THE TOTAL ELIMINATION IN 1973  
OF DEATHS FROM SELECTED CAUSES



THE AGED POPULATION OF THE UNITED STATES IN THE YEAR 2000 BY SELECTED AGE GROUPS FOLLOWING THE GRADUAL ELIMINATION BY THE YEAR 2000 OF DEATHS FROM SELECTED CAUSES



PROPORTION OF TOTAL POPULATION AGE 65 AND OVER FOLLOWING  
THE TOTAL ELIMINATION IN 1973 OF DEATHS FROM SELECTED CAUSES

